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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/563,126

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Yasufumi Takahashi

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EXAMINER

HODGE, ROBERT W

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/563,126	Applicant(s) TAKAHASHI ET AL.	
	Examiner ROBERT HODGE	Art Unit 1729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,6,8,9,11 and 12 is/are pending in the application.
- 4a) Of the above claim(s) 8 and 9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,6,11 and 12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 7/12/10 have been fully considered but they are not persuasive. Applicants are incorrectly paraphrasing the Yonekawa reference. The passage in paragraph [0009] that applicants direct the Examiner to states: "A part of Co is uniformly replaced by zirconium atom, without ZrO_2 with an unreacted lithium cobalt system multiple oxide obtained". The sentence does not say that all of the ZrO_2 is fully reacted as applicants improperly state, the term "unreacted" is next to "lithium cobalt system multiple oxide" and therefore is referring to the "lithium cobalt system multiple oxide", not ZrO_2 , which also supports the Examiners position since not all of the lithium cobalt system multiple oxide compound is reacting with the ZrO_2 . The Examiner is using the machine translation of JP 2002-358963 which was provided to applicants on 9/18/09, if applicants are relying on another translation of said reference then it is applicants duty to disclose said translation under the requirements of 37 CFR 1.56. With regards to paragraph [0033], applicants' attention is drawn to the word "substantially", which applicants cite to the Examiner. By use of the term "substantially" Yonekawa does not absolutely say that every single ZrO_2 molecule has been reacted. Furthermore in paragraph [0025] it states "With ZrO_2 which remains in the lithium cobalt system multiple oxide after calcination. ZrO_2 unreacted when ZrO_2 is used as a zirconium compound remains as it is". The above passage confirms the Examiner's position with regards to not all of the ZrO_2 reacting. With regards to applicants' statement that the position of the Office is base on only an incorrect calculation and

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assumptions, said statement is not backed up by any evidence and is only an unsupported allegation. Applicants are directed to Chemical Principles, second Edition by Steven S. Zumdahl pages 67-70, which defines how Chemical Equations must be properly balanced using the number of atoms of each chemical element and the number of moles present. The calculations provided to applicants were correctly calculated using only the data provided in the Yonekawa reference without making any assumptions. Applicants are invited to provide their own calculations of the Yonekawa reference using only the data provided by Yonekawa without assumptions by following the guidelines of how to balance Chemical Equations provided by Zumdahl. Therefore applicants' remarks are not persuasive for all of the reasons provided herein and already made of record.

With regards to Le, applicants state that the entire range of an electrolyte solution containing 10-20% by volume of ethylene carbonate as a solvent provides unexpected results as shown by Table 2 of the instant disclosure. However Table 2 only shows data for the end points of 10% and 20% respectively, it does not show any data points between 10% and 20%. Therefore applicants have not provided a sufficient amount of data to show unexpected results over the entire range of the ethylene carbonate concentration. Applicants must provide a sufficient amount data points within the range of 10-20% by volume of ethylene carbonate to show that the supposed unexpected results are achieved throughout the entire range. Furthermore applicants have provided only one data point of 30% ethylene carbonate with 0.5 mole% of Zr which is outside of the range. There are no data points that are below the range or data points that are

adjacent the range. This data is necessary to determine whether or not the specificity of the range is critical to the instant invention. Applicants are invited to provide more data through a declaration under 37 CFR 1.132 to meet the requirements of unexpected results.

Claim Rejections - 35 USC § 102

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-3 and 6 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by JP 2002-358963 hereinafter Yonekawa.

Yonekawa teaches a nonaqueous electrolyte secondary battery which has a positive electrode containing lithium cobalt oxide as a positive active material, a negative electrode containing a graphite material and a nonaqueous electrolyte solution containing 10-20% by volume of ethylene carbonate as a solvent and which is charged with an end-of-charge voltage of at least 4.3 V, said battery being characterized in that said positive active material is a product obtained by firing a mixture of a lithium salt, tricobalt tetraoxide (Co_3O_4) and a zirconium compound at a temperature of below 900 °C. but not below 700 °C, such that the zirconium compound is in an amount of less than 1 mole % but not less than 0.1 mole %, based on the total mole of cobalt and zirconium that has a particle diameter from 100 nm to 3 μm , and the zirconium compound adheres onto particle surfaces of said lithium cobalt oxide (paragraphs [0012]-[0014], [0019], [0022], [0024], [0031], [0038], [0042], [0044] and [0052]-[0055]). In paragraph [0032] Yonekawa teaches that “ ZrO_2 does not remain in the form

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separated with the lithium cobalt system multiple oxide". As understood by said disclosure the ZrO_2 is not a separate powder, it is part of the same powder mixture that includes the lithium cobalt multiple oxide and cannot be separated which if it cannot be separated than it is adhered to said lithium cobalt multiple oxide, which reads on the claims as recited. Furthermore looking at the example starting in paragraph [0053] by taking the amounts of chemicals added to the mix and converting their masses to moles present in the reaction and using oxygen as the base since it is common among all of the chemicals either reacted or formed, there is 1.4608 moles of oxygen present to be reacted. Therefore *arguendo* if all of the reaction products are reacted to form the final product then there must be 0.73 moles of $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ to balance out the Oxygen atoms. If *arguendo* 0.73 moles of $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ is in fact formed (which is not possible) then that would mean that there is 0.73073 moles of Li, 0.72927 moles of Co and 0.00073 moles of Zr. However none of the above listed mole values can exist because the reaction molecules only contain 0.52 moles of Li, 0.51 moles of Co and 0.0004 moles of Zr. The law of conservation of mass states that the amount of material put into a reaction must equal the amount of material that comes out of the reaction (i.e. materials produced and unreacted), which means that matter cannot be created or lost. Not to mention the carbon atoms which are not accounted for in the lithium multiple oxide, the carbon cannot just disappear. Therefore the reaction in Yonekawa's example clearly cannot convert all of the reaction materials to $\text{Li}_{1.001}\text{Co}_{0.999}\text{Zr}_{0.001}\text{O}_{2.001}$ since there is not enough moles of atoms present to provide a complete conversion and also the fact that the carbon is not accounted for. Therefore it

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is quite clear that not all of the reaction products including ZrO_2 will be reacted and there will in fact be unreacted ZrO_2 in the final product. It is also quite clear that Yonekawa's final product will inherently have ZrO_2 particles adhered to the lithium cobalt oxide, especially given the fact that Yonekawa is performing the same exact process by mixing a lithium salt with tricobalt tetraoxide and zirconium oxide and firing the mix. Therefore since it is clear that there will in fact be unreacted ZrO_2 particles and Yonekawa teaches the same exact method as recited in the claims the final product of Yonekawa reads on the instant claims as recited and the burden is shifted to applicants to prove in the form of evidence otherwise.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yonekawa as applied to claims 1 and 2 above.

Yonekawa further teaches in paragraph [0053] that the ratio of Zr to Li is rather small (around 0.7%) and given the fact that some of the ZrO_2 will react and some of it won't the amount of ZrO_2 present to adhere to the surface will in fact be reduced which means that there is not enough ZrO_2 present to cover even 1% of the surface of the lithium cobalt oxide that is formed during the reaction. Yonekawa teaches the claimed invention except for expressly stating "at least 80% of the particle surface being left uncovered". It would have been obvious to one having ordinary skill in the art at the

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time the invention was made to optimize the amount of metal oxide particles adhered to the cathode active material particles to be less than 80% since Yonekawa does not teach enough material to cover even 1% of the surface and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See MPEP 2144.05.

Claims 1-3, 6, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over by U.S. Pre-Grant Publication No. 2004/0121234 hereinafter Le in view of U.S. Patent No. 5,030,528 hereinafter Shen.

With regards to claim 1, Le teaches a nonaqueous electrolyte secondary battery which has a positive electrode containing lithium cobalt oxide as a positive active material, a negative electrode containing a graphite material and a nonaqueous electrolyte solution containing ethylene carbonate as a solvent and which is charged with an end-of-charge voltage of at least 4.3 V, said battery being characterized in that a zirconium-containing compound adheres onto particle surfaces of said lithium cobalt oxide (abstract and paragraphs [0008]-[0009] and [0026]-[0047]).

Le does not teach the amount of ethylene carbonate present in the electrolyte solution.

Shen teaches a lithium secondary battery wherein the nonaqueous solvent mixture comprises 10-20% by volume of ethylene carbonate (abstract and column 2, line 62 - column 3, line 4).

At the time of the invention it would have been obvious to one having ordinary skill in the art to regulate the amount of ethylene carbonate present in the electrolyte

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solution such that it is between 10-20% by volume in Le as taught by Shen in order to provide a lithium secondary battery having an improved electrolyte that will have lower internal impedance, longer cycle life, higher energy density, low self-discharge and a longer shelf life (abstract of Shen). If a technique has been used to improve one device (regulating the amount of ethylene carbonate present in the electrolyte solution such that it is between 10-20% by volume), and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way (providing a lithium secondary battery having an improved electrolyte that will have lower internal impedance, longer cycle life, higher energy density, low self-discharge and a longer shelf life (abstract of Shen)), using the technique is obvious unless its actual application is beyond his or her skill. See MPEP 2141 (III) Rationale C, KSR v. Teleflex (Supreme Court 2007).

With regards to claims 2-3 and 6, Le further teaches that the zirconium compound is in an amount of less than 1 mole % but not less than 0.1 mole %, based on the total mole of cobalt and zirconium that has a particle diameter from 100 nm to 3 μm (see citations above).

With regards to claims 11 and 12, Le teaches in paragraph [0042] that the metal oxide particles are adsorbed on the surface of the cathode active material (i.e. does not exist as a film or shell covering the core of the active material) and that the surface is preferably partially covered with the metal oxide particles without affecting the transport of lithium to and from the active particles. Le teaches the claimed invention except for expressly stating "at least 80% of the particle surface being left uncovered". It would

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have been obvious to one having ordinary skill in the art at the time the invention was made to optimize the amount of metal oxide particles adhered to the cathode active material particles in order to prevent a film or shell from forming which would prevent the transport of lithium to and from the active particles and since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See MPEP 2144.05.

The examiner notes that claims 2-3, 6, and 12 are product-by-process claims. "Product-by-process claims are not limited to the manipulations of the recited steps, only the structure implied by the steps". See MPEP § 2113. Therefore because all of the structure recited in claims 2-3, 6, and 12 is present in the Le reference, claims 2-3, 6, and 12 are included in the above 103(a) rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT HODGE whose telephone number is (571)272-2097. The examiner can normally be reached on 8:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ula Ruddock can be reached on (571) 272-1481. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert Hodge/
Primary Examiner, Art Unit 1729